

Abstract

A processing solution for forming a hexavalent chromium free, corrosion resistant trivalent chromate conversion film on zinc or zinc alloy plating layers comprises: trivalent chromium and oxalic acid in a molar ratio ranging from 0.5/1 to 1.5/1, wherein the trivalent chromium is present in the form of a water-soluble complex with oxalic acid; and cobalt ions, which do not form a hardly soluble metal salt with oxalic acid and are stably present in the processing solution without causing any precipitation; wherein the solution reacts with zinc when bringing it into contact with the zinc or zinc alloy plating to form a hexavalent chromium free, corrosion resistant, trivalent chromate conversion film containing zinc, chromium, cobalt, oxalic acid and silicon on the plating. The film is quite thin, free of any hexavalent chromium, has corrosion resistance identical to or higher than that achieved by the conventional hexavalent chromium-containing film and can be formed using a processing solution having a quite low concentration.